

Risk Engineering, Sciences, Computation, and Informed Decisions, Phase I

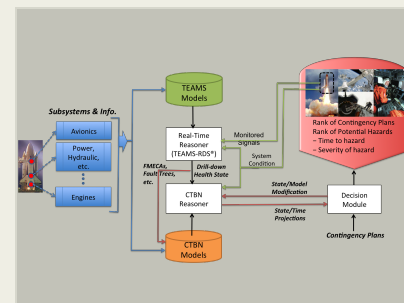
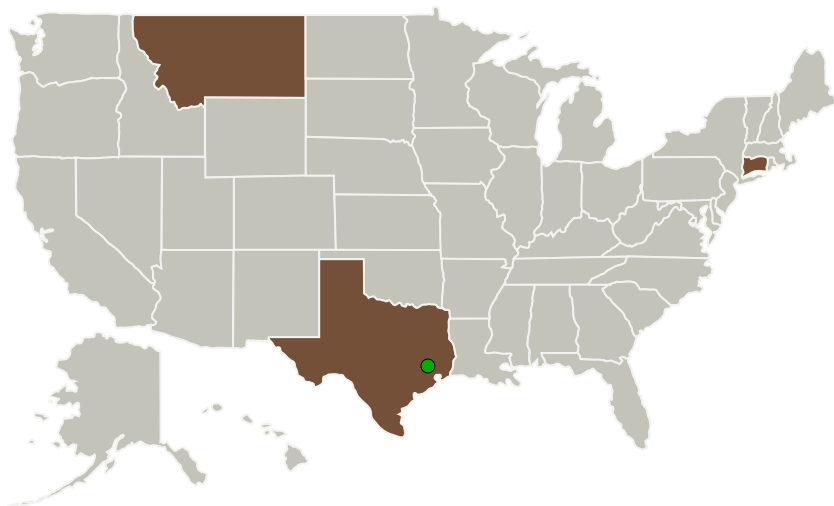
Completed Technology Project (2013 - 2014)



Project Introduction

Wrong decisions during the missions can lead to an unsafe condition or immediate failure, while correct decisions can help continue the missions even from faulty conditions. In view of the lessons learned from mishaps, i.e., failed space missions, it is imminent that reliability analysis and risk assessment are kept in sync with space system design as it evolves from the concept through preliminary design, detailed design, production, and operations. Qualtech Systems, Inc. (QSI) in collaboration with Dr. John Sheppard from Montana State University (MSU) proposes a real-time health and risk assessment solution. The proposed efforts through this project in developing real-time computer-based environment for diagnosis, risk assessment, and visualization of system status will provide: (1) an environment for thorough and collaborative analysis and evaluation of a system design before the system is built and commissioned, (2) real-time diagnosis to identify Good, Bad, Unknown, Suspect, Degraded and Suspected Degraded of subsystems/components, (3) state of redundancies in real-time in case of single/multiple faults, (4) degradation status/criticality/time-to-failure, (5) risk identification of software and loss of mission/vehicle/life, (6) recommendation of a safer state to go to, and (7) visualization of risk (rank-ordered missions, probability of mission success, schedule and cost), mission criticality, and diagnostic coverage. The proposed solution should be of significant relevance to NASA's space missions because it provides capabilities in characterizing as system in its failure space as well as uncovering and managing risks as the system design evolves.

Primary U.S. Work Locations and Key Partners



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Computation, and Informed
Decisions

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Organizations Performing Work	Role	Type	Location
Qualtech Systems, Inc.	Lead Organization	Industry Minority-Owned Business, Small Disadvantaged Business (SDB)	Rocky Hill, Connecticut
● Johnson Space Center(JSC)	Supporting Organization	NASA Center	Houston, Texas
Montana State University - Bozeman	Supporting Organization	Academia	Bozeman, Montana

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Qualtech Systems, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Sudipto Ghoshal

Co-Investigator:

Sudipto Ghoshal

Primary U.S. Work Locations

Connecticut

Montana

Texas

Project Transitions

**May 2013:** Project Start**May 2014:** Closed out**Closeout Documentation:**

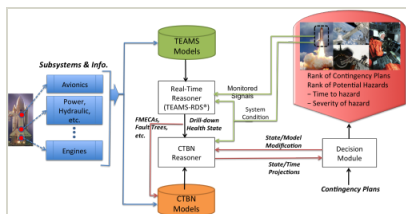
- Final Summary Chart(<https://techport.nasa.gov/file/140475>)

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Images



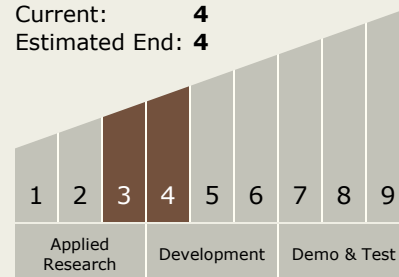
Project Image

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(<https://techport.nasa.gov/image/131763>)

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



Technology Areas

Primary:

- TX10 Autonomous Systems
 - TX10.2 Reasoning and Acting
 - TX10.2.5 Fault Diagnosis and Prognosis

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System